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LIFE ON MARS ?

Over the past months we have seen very important developments in the search for life elsewhere – or 'Extra-Terrestrial Life'. So far, there have been two opposing points of view:
1. Life on Earth exists thanks to a miraculous combination of favourable circumstances, and it is most improbable that exactly these same circumstances exist on other planets. So we must conclude that in all probability there is no life elsewhere.
2. There are at least three reasons to think otherwise:

- Life is enormously flexible (in polar regions, in deserts, in deep oceans, in caves etc.) Life adapted itself to the most bizarre conditions – and may have done so on other planets as well, also if the conditions are very different from those on Earth.
- Life's building material (carbonaceous material and amino acids → proteins) - was brought to Earth from space by meteorites and comets. Why would that not also have happened on other planets?
- Statistical probability - There are trillions of stars, many of which have planets, so even if the chances for the development of life are extremely small – say one planet per billion stars – than there must still be countless planets where life could exist.

When looking for ET-life, we have to think of planets and moons, stars always being far too hot. Understandably, we have started to look within our own Solar System, and the best chances so far have been found on Mars: we know that there is water – and much larger quantities than nowadays in its early history – and we know that in those earlier times Mars had a denser atmosphere and a better climate. Of course that doesn't mean that there is *proof* that life exists or has existed on the Red Planet. But over the past years it has begun to look as if that may be going to change, mainly thanks to meteorites from Mars which have been found on Earth.
In 1984 a meteorite, the size of a pineapple, was found by a NASA scientist in the Allen Hills region of Antarctica. Extensive research showed that it originated from Mars, came down in Antarctica about 13,000 years ago and was the result of a huge meteorite impact on Mars some 16 mln years ago.
In 1996 – 12 years after scientists had started to study the meteorite – NASA told at a press conference that micro fossils of bacteria had been found in the rock and that this almost certainly indicated that life – at least in a very primitive form – must have existed on Mars.
Immediately, a world-wide debate started between scientists who believed NASA, and others who pointed out that what was discovered inside the piece of rock could just as well have other origins, which had nothing to do with life. In the course of years since 1996 some thousand publications have been devoted to this question.
But now, some 13 years later, there are important new developments. Last November, NASA announced that, thanks to the development of new technique and tools – especially in the field of advanced microscopy – it had been possible to prove that many of the 'opposing life theories' must be wrong.
That was followed this month by the announcement that further evidence had been found in two other meteorites from Mars: the Nakhla meteorite, that fell near the Egyptian town of that name in 1911, and the Yamato meteorite, found by Japanese scientists in Antarctica in 2000.
They both contain the same fossil signs of possible life as found in the Allen Hills meteorite, but of a much younger date: *Allen Hills* = 3.6 bn years old, the other two about 1.4 bn years.
This combination of three sources from very different periods clearly broaden the evidence that simple life forms may have existed in large areas on Mars over a long period of time – and perhaps even until today.
Scientists now believe that during this year it will be possible to definitively prove that meteorites from Mars contain fossils of ancient life on Mars.
This would be an unbelievably important result, one of the greatest discoveries ever made.
We'll have the first proof that Earth is not the only place where life has existed. And then, if we have found signs of life on almost our nearest neighbouring planet, we may well expect it to have existed or still be present in many other places of the Universe.

Important events in 2009

The *International Year of Astronomy* saw an impressive number of important spacecraft launches.
In March the space telescope *Kepler* was launched on a mission to find more extra-solar planets, preferably Earth-like planets.
In May, ESA launched two important new space telescopes: *Herschel* and *Planck. Herschel* will observe the infrared Universe – especially from very old times – and *Planck* the Cosmic Microwave Background Radiation (also from the oldest part of the Universe's history, only 400,000 years after the Big Bang).
In June the spacecraft LRO (*Lunar Reconnaissance Orbiter)* was launched towards the Moon. Since it came in orbit, it has produced fantastic, detailed pictures of the surface of the Moon.
And in December the WISE (*Wide-field Infrared Survey Explorer*) was launched (see below).

About a month ago NASA announced that the *Kepler*-telescope has discovered five new 'hot Jupiters' in six weeks time. *Kepler* orbits the Sun and its task is to observe some 100,000 carefully selected stars in a small part of the Milky Way to see if there are planets orbiting these stars, in other words, if there are other 'solar systems'. It does so by measuring tiny dips in the light – down to 0.01% - emitted by the stars in question.

The *WISE-telescope (Wide-field Infrared Survey Explorer)* was launched with the aim to picture the whole sky with high-tech infrared cameras. The last time the whole sky was mapped was 26 years ago, and as technology has developed enormously since then, the results will undoubtedly be much better. The complete picture should be available in March 2012.

In May, the repair mission to the *Hubble Space Telescope* – the last one – became a great success. Repairs were carried out, while new cameras and other instruments were installed.

The year 2009 saw, of course, also a lot of new development around the *International Space Station.* There were the regular trips to and from the ISS by NASA's shuttles and Russian Soyuz spacecraft and by unmanned cargo missions. As a result, the station neared its completion. There are now, among many other things, laboratories from NASA, ESA and Japan, as well as some external platforms. By the end of May, the 'permanent' crew could be increased to six.
The shuttles are approaching the end of their long life, which means that for the coming years, when it successor has not yet been built, all transport will depend on the Russian Soyuz.

There was interesting news about Saturn: As expected (once every 15 years), August saw Saturn's equinox, and in October, totally unexpectedly, a huge but very faint 'new' ring was discovered around Saturn.

In September/October water was discovered on the Moon by the LRO (+LCROSS) and by the Indian spacecraft *Chandrayaan,* and also in October large quantities of water-ice were discovered on Mars, at lower latitudes than the polar regions. This may suggest that the ice sheet beneath the Martian surface is much larger than had been suspected.

In November the *Large Hadron Collider* was restarted, more than a year after its failure in September 2008. Two beams of protons have already collided, but not yet at full speed/energy. The 'machine' was switched off before Christmas and was to be restarted in the course of January.

What to expect in the year 2010?

The new year will have four eclipses. One has passed already, namely a solar eclipse that was visible across Eastern Africa and the Indian Ocean. A partial lunar eclipse will be visible across the Southern Pacific on 26th June, and the same area will see a solar eclipse – up to 5 minutes this time - on 11th July, Then finally, the only eclipse visible from Britain, will be a total lunar eclipse on 21st December.